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ABSTRACT

To investigate prospects for enrollment decline, institutional researchers from Michigan's 15 public universities participated in an enrollment project grounded in detailed examination of headcounts and credit hours over time. Each institution reported enrollment for 12 fall terms (1974 through 1985) categorized by age group, gender and degree level (baccalaureate, first professional, graduate). The data were aggregated and used in conjunction with state demographers' cohort population estimates to compute enrollment rates and average credit hour loads for 66 student subgroups, and the effect on enrollments of a changing population profile (fewer 18- to 24-year olds and more older people) was isolated. This phase produced an estimate that population shifts would cause systemwide headcounts to decline by 11% between 1985 and 2000, while credit hours would drop by 13%. A multiple regression model was tested that was design to relate the enrollment behavior or various age-sex-degree level groups to variations in income, unemployment, tuition and financial aid. Although the limited number of observations mandated cautious interpretation, sensitivity to the economy and college costs clearly varied considerably from one subgroup to another. Alternate projections were generated using two models. Data are presented in four tables and a figure. Contains 9 references. (Author/KM)

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USING AGE, GENDER, AND DEGREE LEVEL TO PREDICT HEADCOUNT AND CREDIT HOUR ENROLLMENT

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USING AGE, GENDER, AND DEGREE LEVEL
TO PREDICT HEADCOUNT AND CREDIT HOUR ENROLLMENT

Abstract

Sharply differing views about the prospects for enrollment decline within their "system" of institutions persuaded institutional researchers from Michigan's 15 constitutionally-autonomous public universities to participate in an enrollment projection project that would be grounded in detailed examination of headcounts and credit hours over time. Each institution reported enrollment for 12 fall terms -- 1974 through 1985 -- in a matrix of cells defined by age group, gender, and degree level (baccalaureate, first professional, graduate). A subcommittee aggregated the enrollment data for the "system" and used them in conjunction with state demographers' cohort population estimates to compute enrollment rates and average credit hour loads for 66 subgroups of students. The 1985 rates were applied to cohort population projections, and 1985 course loads were applied to projected headcounts, in order to isolate the effect on enrollments of a changing population profile (fewer 18-24 year olds, more older people). This phase of the project produced an estimate that, *ceteris paribus*, population shifts would cause systemwide headcounts to decline by 11 percent between 1985 and 2000 while credit hours would drop by 13 percent. Next, the authors tested a multiple regression model designed to relate the enrollment behavior of various age-sex-degree level groups to variations in income, unemployment, tuition, and financial aid. The limited number of observations mandated cautious interpretation. It was clear, however, that sensitivity to the economy and college costs varied considerably from one subgroup to another. Alternate projections to 2000 were generated using a "Recession" model and a "Recovery" model.

USING AGE, GENDER, AND DEGREE LEVEL TO PREDICT HEADCOUNT AND CREDIT HOUR ENROLLMENT

Background of the Study

Almost by definition, longitudinal research is conceived in response to one set of concerns and concluded amidst questions that have changed with time. The enrollment projection project sponsored by the Presidents Council of State Universities in Michigan, and conducted by members of its Analytical Studies Committee, is no exception.

The study was initiated in the late 1970s, when the specter of retrenchment haunted many a college administration building. At that time, it was common for interpreters of the impending decline in the 18-24 "college-age" population to warn capitol and campus decision-makers that they should prepare for a severe enrollment decline in the 1980s and 1990s -- one that institutions should anticipate by sharply reducing expenditures for faculty, support staff, and operation of physical plant.[1] The few contrarians who believed older students could take up much of the baby-bust slack were challenged on at least two counts.

One popular counter-argument relied on the widespread belief that older, "non-traditional" students take only one or two courses at a time whereas younger "traditional" ones usually attend full-time; thus (if both assump-

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Note: The authors acknowledge with gratitude the contributions of State of Michigan demographers Laurence Rosen and Ching-Li Wang, the institutional researchers, registrars, and others who provided institutional data, Hong Park, Professor of Economics, Alex Ross, Professor of Sociology, and Janet Joyce, Microcomputer Laboratory Coordinator, at Saginaw Valley State University, and staff members of the Presidents Council.

tions are true) it would take several older students to contribute as much tuition as one 18-21 year old undergraduate or one 22-24 year old student in a graduate or professional degree program.

A second rejoinder to optimists about future enrollment was the assertion that four-year institutions would barely notice the back-to-college movement because older students usually attend community colleges. This reasonable belief reinforced the concerns of administrators and faculty in the four-year sector.

During the decade from start to conclusion of the Michigan Presidents Council enrollment study, the ratio of optimists to pessimists has grown. The question, "Whatever happened to the enrollment decline?" is asked and answered in an exchange of letters to The Chronicle of Higher Education [Jan. 6, Jan. 27, and Feb. 3, 1988] and articles in other higher education publications [Frances 1980, Leslie and Conrad, 1986]. Significantly, the U.S. Department of Education's Center for Education Statistics (CES) has revised upward its forecasts for higher education enrollments during the remainder of this decade [NCES 1980]. For example, in 1980 the then NCES (N for National) intermediate projection foresaw 11 million students enrolled in all sectors of higher education in 1988. The latest "most likely" forecast for the same year is 12.3 million [CES 1987].

As of 1985-86, some institutions had indeed experienced the expected decline in enrollments, but a larger number had maintained their size or grown [El-Kawas 1986]. The debate which gave rise to this project in 1979 thus continues in a calmer vein. However, enrollment projections that take age,

gender, and degree level into account continue to be needed, in Michigan and elsewhere, as most of the nation approaches the steep decline in 18-24 year olds that will undeniably take place between 1989 and 1994. (A few states have growing youth populations [WICHE 1984]. In those states, the motivations for relating enrollment projections to population profiles will be different, but no less important.)

Although CES projections and many other analyses at the national and state level do consider age, gender, and degree level, they usually rely on rates of enrollment in *all* institutions of higher education estimated from the Census Bureau's Current Population Surveys. The present study depends, instead, on actual enrollment data for one sector (public universities) in one state (Michigan). It also investigates empirically the relationship between age/gender/degree-level and the course loads students carry.

It is doubtful that the system enrollment rates for various age-sex-degree level groups discovered in the Michigan study can be generalized to four-year public systems in other states. Differences in access to alternative institutions (community colleges, independent institutions) and in pricing policies are two of the variables that make such extensions of the data problematical. Therefore, the method of deriving enrollment rates will be of greater interest to most readers than the rates themselves.

On the other hand, the authors theorize that average course loads for the various subgroups of students may be similar in many settings to those discovered in the Michigan study. How many credits men and women of various ages carry depends in large part on life-stage considerations that are all-

American. Across the nation, moreover, a powerful influence on course loads is the number of credits that qualify a student for federal, state, or institutional financial aid. Clearly, too, course load differences are severely constrained in most professional schools by the structure of the curriculum and the associated preference for admitting full-time students.

Research Questions and Method

The Michigan study was designed to answer the following questions:

1) Other things being equal, how will the changing age profile of the state's population affect headcount and credit hour enrollments in the four-year public university system during the rest of the century?
2) What is the likely impact of the changing attendance rates of men and women, and
3) What short term effects on the enrollment of men and women of various ages may be anticipated as unemployment rises or falls and the cost of attending becomes more or less affordable?

The design for answering the first and second questions is unusual -- perhaps unique -- but very simple. Annual enrollment rates for 66 age-sex-degree-level subgroups of students are computed as:

$$\frac{\text{Actual Headcount Enrollment}}{\text{Number of Persons in State Population Cohort}}$$

(Use of a state population base assumes that the proportion of out-of-state students will remain constant during the projection period.)

Average credit hour loads for the 66 subgroups are computed as:

$$\frac{\text{Subgroup Credit Hours}}{\text{Subgroup Headcount}}$$

The results of these simple computations are presented in the next section and then used to demonstrate the effect of a changing population mix on the enrollment prospects of the Michigan universities. The results of incorporating economic variables is discussed in a later section.

Enrollment Rates

Table 1 displays enrollment rates for undergraduates during the fall terms from 1974 through 1985. Tables showing rates for graduate students and professional students are available on request.

Table 1

Enrollment Rates in Undergraduate Programs: Michigan Public Universities, 1974 - 1985
(students as a percent of state population cohort*)

Age Group->	Under 18	18-19	20-21	22-24	25-29	30-34	35-39	40-44	45-49	50 & Up
a. Men										
1974	0.36	14.52	15.97	7.83	3.25	1.02	0.49	0.22	0.12	0.04
1975	0.38	14.90	15.85	7.75	3.65	1.47	0.84	0.41	0.14	0.07
1976	0.30	14.68	15.51	7.15	3.35	1.40	0.48	0.26	0.13	0.07
1977	0.29	14.24	15.33	6.95	3.06	1.42	0.51	0.25	0.13	0.07
1978	0.37	14.09	14.94	6.54	2.68	1.36	0.46	0.24	0.15	0.10
1979	0.37	14.59	14.84	6.59	2.36	1.27	0.46	0.24	0.14	0.05
1980	0.51	15.92	16.46	7.07	2.28	1.07	0.41	0.23	0.11	0.07
1981	0.59	15.87	16.37	7.15	2.24	1.04	0.50	0.27	0.14	0.07
1982	0.47	15.25	16.79	7.27	2.22	1.07	0.52	0.27	0.14	0.07
1983	0.53	15.41	16.86	7.50	2.23	1.11	0.57	0.31	0.17	0.09
1984	0.63	16.08	16.42	7.49	2.04	1.07	0.55	0.29	0.15	0.06
1985	1.07	16.13	17.53	7.16	1.86	0.99	0.53	0.30	0.13	0.06
b. Women										
1974	0.54	14.84	14.52	4.16	1.32	0.80	0.63	0.43	0.28	0.11
1975	0.54	15.53	14.32	4.35	1.41	0.85	0.63	0.42	0.29	0.12
1976	0.44	15.48	14.39	4.47	1.48	0.93	0.69	0.44	0.29	0.12
1977	0.39	15.47	14.56	4.70	1.55	1.01	0.73	0.45	0.32	0.13
1978	0.48	15.52	14.43	4.68	1.59	1.04	0.75	0.48	0.33	0.16
1979	0.51	16.06	14.60	4.90	1.70	1.10	0.80	0.52	0.35	0.12
1980	0.66	17.28	15.55	5.07	1.79	1.17	0.85	0.56	0.35	0.13
1981	0.75	16.97	15.10	5.13	1.84	1.17	0.91	0.60	0.37	0.14
1982	0.60	16.23	15.53	4.99	1.69	1.12	0.85	0.62	0.37	0.14
1983	0.68	16.61	16.06	5.12	1.68	1.14	0.90	0.63	0.39	0.15
1984	0.82	17.58	16.03	5.34	1.62	1.14	0.96	0.66	0.39	0.13
1985	1.55	19.17	16.82	5.45	1.61	1.21	0.98	0.68	0.40	0.12

*Cohort for Under 18 is population ages 15-17; cohort for 50 & Up is population ages 50-64.

Over the 12 year period of the study, enrollment rates rose significantly

for male undergraduates in the youngest age groups (under 18, 18-19, and 20-21). Rates for 22-24 year old males dropped slightly from 1977 through 1979, then inched upward again. A steady decline among 25-34 year old males is consistent with the fact that large numbers of Vietnam-era veterans used up their eligibility for GI Bill benefits in the mid 1970s and began an exodus from college campuses. Between 1974 and 1985, enrollment rates for older male students fluctuated in a narrow range.

Enrollment rates for undergraduate women exhibited a rising trend in all but the oldest age group, those over 49 years of age, among whom the rate of enrollment was stable. Throughout the 12-year period, a higher proportion of young women (under 22) than young men attended the state universities. Between the ages of 22 and 34, male rates exceeded those of women; in the older age ranges, once again, female rates were higher than those of men.

In the prime age ranges for graduate students, enrollment rates for both men and women declined between 1974 and 1985, a phenomenon logically related to the poor job market for K-12 and college teachers. Another factor may be the ability of baccalaureate graduates in some disciplines, e.g. engineering, to command such high salaries that there is little incentive to attend graduate school.

Male and female graduate students who were 22-24 years old constituted 2.6 and 2.2 percent of their respective age cohorts in 1974, but those figures had dropped to 1.5 and 1.3 percent by 1985. In the 25-29 age range, graduate school enrollment rates for men declined from 3.2 percent of the state population cohort in 1974 to 1.5 percent in 1985; those for women fell

from 2.1 to 1.2 percent. Enrollment rates for men 30-34 dropped over the 12-year period; those for women in the same age bracket rose until 1979, then returned to and fell slightly below 1974 levels. The proportion of older men enrolling in master's and doctoral programs was stable over the period. The proportion of women ages 35-49 increased somewhat.

Rates of enrollment in professional programs -- primarily medical and law schools at the University of Michigan and Wayne State University plus human and veterinary medical schools at Michigan State University -- exhibited different trends for men and women. While rates for men ages 22-29 dropped, rates for women of all ages increased. In 1974, men aged 22-24 were four times more likely to enroll in professional programs than women of the same age, but by 1985 the difference had shrunk to 2-to-1. Through 1982, professional headcount enrollments increased each year; therefore, it appears that only a few male applicants were squeezed out simply because more women applied and were accepted.

Credit Hour Loads

The most interesting and perhaps the most useful result of the study was the empirical discovery of average course loads for men and women of various ages. An exploratory investigation of credit hour loads in 11 of the 15 Michigan universities for a single term, Winter 1977, preceded this study [Dickey 1979]. The outcome was aesthetically pleasing, as well as instructive; average credits declined very gradually in successively older age groups. The differences between the course loads of young adults and older students was considerably smaller than commonly supposed. It was clearly not the case that three or four older students were needed to contribute as

much tuition as one young adult; indeed the ratio was less than 2-to-1.

Findings consistent with those of the exploratory study emerged from our systemwide examination of the course loads of more than 200,000 students attending the 15 institutions over a 12-year period. Average credits for men and women undergraduates appear in Table 2. (Readers may request tables showing course loads of graduate and professional students.)

Table 2

Trends in Undergraduate Course Loads: Michigan Public Universities, 1974 - 1985
(average credits carried)

Age Group->	Under 18	18-19	20-21	22-24	25-29	30-34	35-39	40-44	45-49	50 & Up
a. Men										
1974	13.55	14.99	14.55	12.72	11.11	9.27	8.89	8.45	7.77	7.06
1975	13.41	14.93	14.51	12.73	11.27	10.09	10.01	9.86	7.95	9.78
1976	13.30	15.00	14.56	12.85	11.01	9.86	8.49	8.91	8.25	9.71
1977	13.19	14.78	14.30	12.55	10.61	9.66	8.35	8.41	8.15	8.82
1978	12.60	14.71	14.21	12.31	10.42	9.30	7.89	8.16	8.33	8.91
1979	12.90	14.70	14.20	12.34	10.19	8.90	7.47	7.62	7.21	8.03
1980	13.31	14.59	14.14	12.36	10.06	8.55	7.19	7.29	7.32	8.32
1981	13.41	14.77	14.26	12.53	10.11	8.26	6.96	6.71	7.23	7.27
1982	13.17	14.58	14.29	12.70	10.14	8.34	6.99	6.98	6.64	7.07
1983	13.59	14.56	14.21	12.58	10.10	8.29	6.91	6.61	6.49	7.97
1984	13.39	14.38	14.05	12.49	9.83	8.02	7.08	6.66	6.44	5.55
1985	13.40	14.28	13.88	12.40	9.81	8.03	6.79	6.35	6.41	5.01
b. Women										
1974	13.92	14.80	14.48	11.95	9.46	8.90	8.31	8.21	7.38	6.91
1975	13.81	14.74	14.46	12.03	9.55	9.02	8.63	8.13	7.96	7.65
1976	13.50	14.50	14.24	11.83	9.47	8.86	8.34	8.01	7.64	7.57
1977	13.39	14.64	14.17	11.79	9.41	8.76	8.35	8.12	7.94	7.36
1978	13.01	14.52	14.06	11.63	9.20	8.71	8.15	7.88	7.74	7.01
1979	13.05	14.56	14.14	11.64	9.12	8.52	8.11	7.77	7.47	7.36
1980	13.42	14.43	14.11	11.52	9.00	8.15	7.87	7.42	7.22	6.97
1981	13.32	14.59	14.19	11.66	8.76	7.90	7.54	7.13	7.02	6.41
1982	13.49	14.52	14.20	11.89	8.89	8.07	7.74	7.05	6.87	6.21
1983	13.74	14.45	14.15	11.94	8.70	7.82	7.51	6.96	6.62	6.02
1984	13.55	14.24	13.97	11.76	8.61	7.66	7.23	6.78	6.47	5.39
1985	13.33	14.16	13.88	11.76	8.61	7.85	7.43	6.97	6.56	5.37

Course loads for undergraduate men and women were similar in the younger age groups. Between age 22 and 34, men carried more credits; after age 35, women registered for heavier loads.

Of considerable importance to the overall enrollment picture is the rather steady decline between 1974 and 1985 in the course loads of both male and female undergraduates in all age groups. (Approximately 180,000 1985 baccalaureate-level students averaged 12.6 credits, a figure considerably below the 13.5 credits carried by their 1974 counterparts.)

The course loads of male graduate students fluctuated during the 12-year period. The 22-24 year olds averaged 9.1 to 9.5 credits in most years but that figure dropped to 8.8 by 1985. The credits attempted by older men ranged from about seven in the 25-29 age bracket to about five at age 50 and up. As a group, in 1974, women ages 22-24 carried considerably lighter loads than men, averaging 7.4 credits; but by 1985 the difference had all but disappeared. Older women continued to average a fraction of a credit less than men in the same age range.

Among professional students, the course loads of both men and women reversed the undergraduate trend, showing a slight increase over the 12 year period. There was very little difference between men and women. The youngest professional-degree students carried two to three credits more than the older ones, the former averaging 18 to 20 credits.

Distribution of Enrollments by Age Group and Sex

The numbers behind the enrollment rates and average course loads are also of interest. During most of the 12 year period, approximately 80 percent of the students in Michigan universities were under 25 years of age. This is a higher proportion of traditional college-age students than the percentage reported for the nation. According to Current Population Survey estimates,

approximately 52 percent of all U. S. college students were in the 18-24 year age range in 1974, and the proportion of young adult students dropped to 49 percent by 1978 [Frances 1980]. The difference between 49-52 percent for the U.S. and 80 percent for the Michigan universities suggests that older students in Michigan are somewhat more likely to attend one of the state's 29 community colleges than one of the 15 universities. What most older students require is a college within easy commuting distance of their homes and jobs, and not all of them live near a state university.

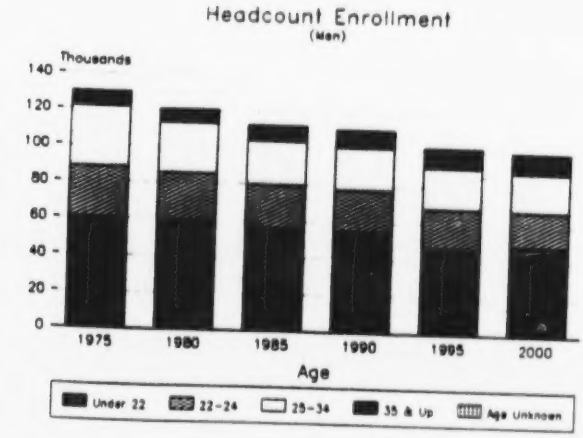
Nevertheless, for many years, the number of older students in Michigan universities has been large enough to have a significant impact on total enrollment; and the weight of their influence will increase as the century draws to a close.

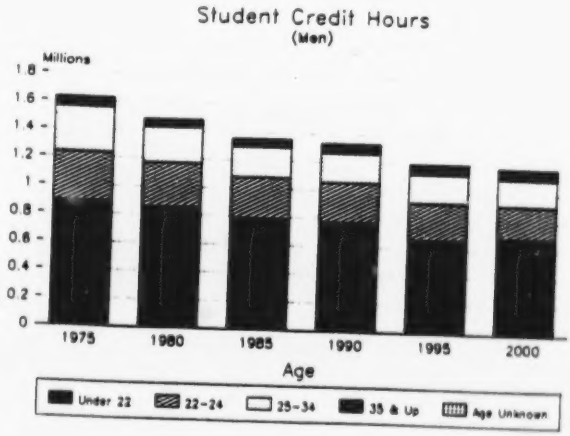
The bar charts in Figure 1, on the next page, display actual headcounts and credit hours for 1975, 1980, and 1985 by age group and gender. They also include projections to 2000 which are based on constant 1985 enrollment rates and credit hours. The projections demonstrate the effect on enrollments of the change in the age/sex distribution of the Michigan population that state demographers expect to occur during the remainder of the century.

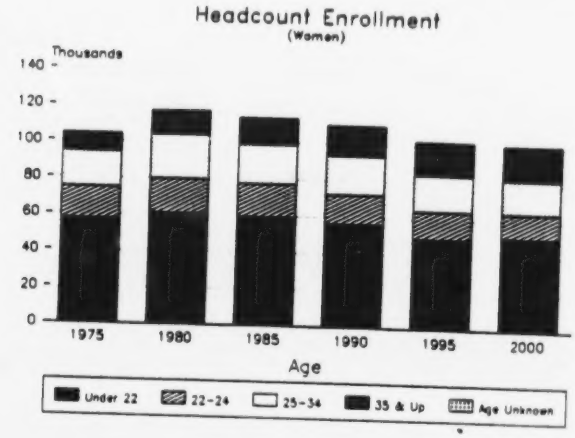
A close examination of the charts shows that the 1975-1985 decline in male headcounts and credit hours occurred primarily among students over 24 years of age, a phenomenon related to the exodus of veterans-in-training. From a combination of Michigan and national data,[2] we estimate that 17,000 veterans were enrolled in the 15 universities under the GI Bill in 1975, and that the number dropped below 5,400 in 1980. By 1985 it had fallen to 1,744.

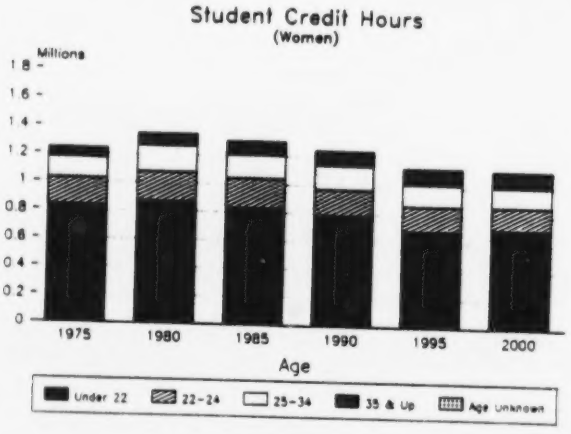
Figure 1

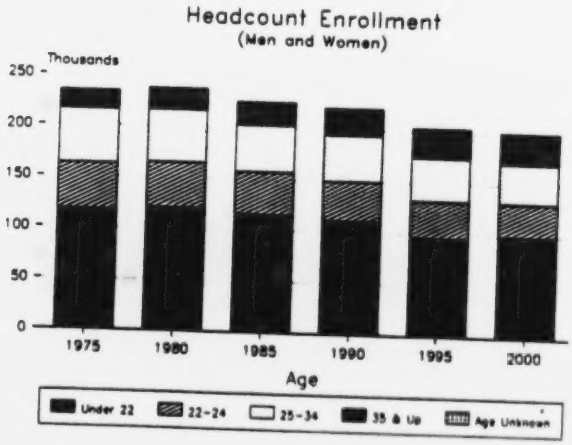
Enrollments by Age Group, 1975-1985
and Projections Showing Effect of Population Change 1990-2000
(Projections Based on 1985 Rates and Course Loads)

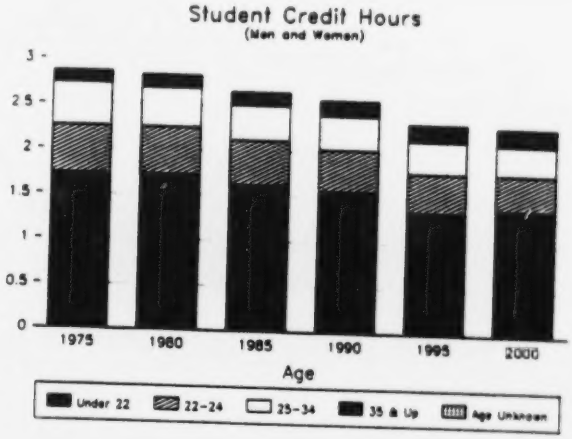












Because the projections in Figure 1 are based entirely on 1985 rates and course loads, they do not take into account the new "wavelet" of veterans that is approaching the shores of academe. Ostar [1987] reported that the Veterans Administration expects the New (1984) GI Bill to stimulate a 25 percent increase in the number of veterans pursuing postsecondary education. At Michigan universities, an increase of that magnitude would amount to about 400 students.

Between 1975 and 1985, among students under 22, enrollment of women caught up with and surpassed that of men. An approach to parity occurred among students ages 22-34, but by 1985 the number of men was still higher by about 5,000. Women made up an increasing proportion of students age 35 and older, who numbered about 21,000 in 1985. All of these trends are halted at 1985 values in the projections based on that year's rates and course loads. Rather than stand still, they may of course continue or reverse.

The projections illustrated in Figure 1 were calculated on the basis of constant 1985 enrollment rates, course loads, and population projections for 10 age ranges plus an 'Age Unknown' group. They were aggregated into five categories simply to facilitate interpretation. The exercise demonstrated that if population projections are accurate and the enrollment behavior of various age-sex subgroups does not change, headcount enrollments will drop about 11 percent by the year 2000 and credit hours will decline by 13 percent. This will happen not only because the pool of persons aged 18-24 will continue to decline, but also because another important source of university students, persons aged 25-34, will start to shrink after 1990. The large, baby-boom contingent is moving toward higher age brackets.

An Exploration of Business Cycle Effects

To be sure, the convention that enrollment behavior will not change is completely unrealistic. The evolving roles of women and the accelerating rate at which knowledge becomes obsolete are examples of trends that currently exert a considerable influence on enrollments. Wartime deferments, wartime training, and the post-war phenomenon of returning veterans increased enrollments during and after World War II and the Vietnam and Korean conflicts; the New GI Bill will also have an effect. The growing proportion of minorities in the youth population and the concurrent approach of a young worker shortage will interact to influence higher education enrollments in ways that cannot yet be foreseen. The subtle pull of business cycles on enrollments is the phenomenon we singled out for scrutiny.

Business cycles swing in wider arcs in Michigan than in most other states. When the market for automobiles and auto parts is good, the effect is so widespread that the average family's personal income is high and the state's tax revenues are healthy. When the nation experiences a recession, joblessness in Michigan soars far beyond the U.S. rate, tax revenues shrink, and those that reach state coffers are likely to be diverted from education to cover the costs of unemployment compensation and welfare payments.

Conceived in this environment, the final phase of the Presidents Council enrollment study section explored the notion that four factors -- income levels, unemployment, tuition costs, and financial aid -- differentially influence the enrollment rates and course loads of men and women of various ages. The first two are basic indicators of business cycles. In the Michigan data, the third, tuition, tends to vary inversely with state appro-

priations, which clearly rise or fall with the economy. The fourth, financial aid, is linked with tuition.[3] Thus we discuss our exploratory investigation in terms of recession and recovery scenarios.

The first independent variable, "Income," (disposable personal income in constant 1974 dollars) was selected as a proxy for the ability to pay for higher education. We assumed that rising income levels would be associated with rising enrollment rates and -- possibly -- higher course loads. We came to view income in a more complex way, as an enrollment-inducing factor for some students and a disincentive for others.

Tuition, operationalized as "Tuit" -- systemwide tuition revenues per FYES (fiscal-year-equated student) in constant 1974 dollars -- was of course intended to measure the cost of attending. Following a basic law of economics, we assumed that rising costs would be associated with falling demand and vice versa.

Financial aid can be viewed either as an addition to income or a reduction a of cost. The variable was operationalized on a per-FYES basis, in constant 1974 dollars, as "Finaid," a sum of federally guaranteed student loans and institutional current fund expenditures. The combination includes all major forms of aid. Although we considered deducting financial aid from tuition to construct a variable representing net cost, we decided to keep them separate. Virtually all students pay tuition, but many do not receive financial aid, which is still is more readily available to young, full-time students than to others.

March and September statewide unemployment rates were obtained from the Michigan Employment Security Commission. After testing both, we selected the September rate because it was more highly correlated with the enrollment rates of most groups. In the tables that follow, it is labelled "Unemp".

Two multiple regression analyses were performed on all but the smallest subgroups, using PC SAS.[4] In the first analysis, the dependent variable was enrollment rate; in the second, it was course load. The four independent variables were entered by the backward elimination method and removed if they failed to meet a .05 criterion for significance. Equations that predict undergraduate enrollment rates and course loads are summarized as Tables 3 and 4. (Readers may request similar tables for graduate and professional students.) The equations are presented primarily as an illustration of research that employs enrollment rates and course loads for various subgroups of students. We also invite discussion of their significance.

Briefly, we observed that real income, which rose over the 12-year period, was most often retained as a variable significantly related to the rising enrollment rates of female students. This may be a coincidence, but it may also mean that the questions "Can we afford to send our daughter to the university?" or "Can I ask my husband to pay my way?" are answered in a way that influences enrollments. In the few subgroups where income predicted male enrollment rates, the sign was usually negative. Is the model misspecified, or are older men less likely to seek further education when the economy is vigorous and earnings are high? We prefer the latter interpretation.

Table 3

Association of Income, Unemployment, Tuition and Financial Aid
With Enrollment Rates of Undergraduates

(Backward Elimination Regressions for Various Age/Gender Groups)

Dependent Variable: UGRATE (percent of population cohort enrolled)

Group	Intercept	Income ($100s)	Unemp (%s)	Tuit ($100s)	Finaid ($100s)	Model R**2	Model F Value	df	Prob>F (Sig.)	1st Order Autocorrelation
Under 18										
Female	-4.5704	0.1073	NS	NS	NS	0.47	8.826	1/10	0.0140	0.15
Male	0.0503	NS	NS	NS	0.0967	0.52	10.739	1/10	0.0083	0.10
18 - 19										
Female	0.1251	0.2943	NS	NS	0.4143	0.78	16.087	2/ 9	0.0011	-0.09
Male	13.3156	NS	NS	NS	0.3995	0.75	29.721	1/10	0.0003	0.12
20 - 21										
Female	-2.4442	0.3186	0.1902	NS	NS	0.86	27.769	2/ 9	0.0001	-0.28
Male	10.4889	NS	0.1450	0.4265	NS	0.72	11.724	2/ 9	0.0031	0.01
22 - 24										
Female	-0.5241	0.0953	NS	NS	0.1606	0.92	50.952	2/ 9	0.0001	-0.08
Male	7.2094	NS	NS	NS	NS	0.00	NA	NA	NS	0.61
25 - 29										
Female	1.2963	NS	NS	NS	0.0689	0.53	11.462	1/10	0.0069	0.59
Male	9.6632	-0.1215	NS	NS	-0.2449	0.88	33.733	2/ 9	0.0001	0.26
30 - 34										
Female	0.7488	NS	NS	NS	0.0688	0.68	21.689	1/10	0.0009	0.42
Male	1.6023	NS	NS	NS	-0.0889	0.62	16.460	1/10	0.0023	-0.22
35 - 39										
Female	-0.6890	0.0256	NS	NS	0.0549	0.97	140.840	2/ 9	0.0001	-0.04
Male	0.5318	NS	NS	NS	NS	0.00	NA	NA	NS	-0.05
40 - 44										
Female	-0.8767	0.0237	0.0117	NS	0.0299	0.99	184.585	3/ 8	0.0001	-0.49
Male	0.2780	NS	NS	NS	NS	0.00	NA	NA	NS	-0.14
45 - 49										
Female	-0.1860	0.0093	NS	NS	0.0172	0.91	45.163	2/ 9	0.0001	-0.01
Male	0.1437	NS	NS	NS	NS	0.00	NA	NA	NS	0.09
50 & Up										
Female	0.1348	NS	NS	NS	NS	0.00	NA	NA	NS	0.15
Male	0.0740	NS	NS	NS	NS	0.00	NA	NA	NS	-0.29

Note: NS denotes elimination of a variable from the model for failure to meet .05 significance criterion.

Table 4

Association of Income, Unemployment, Tuition and Financial Aid
With Course Loads of Undergraduates

(Backward Elimination Regressions for Various Age/Gender Groups)

Dependent Variable: UGLOAD (average credits carried)

Group	Intercept	Income ($100s)	Unemp (%s)	Tuit ($100s)	Finaid ($100s)	Model R**2	Model F Value	df	Prob>F (Sig.)	1st Order Autocorrelation
Under 18										
Female	13.4662	NS	NS	NS	NS	0.00	NA	NA	NS	0.70
Male	13.2738	NS	NS	NS	NS	0.00	NA	NA	NS	0.40
18 - 19										
Female	18.8195	-0.0833	-0.0217	NS	NS	0.85	25.640	2/ 9	0.0002	-0.38
Male	20.2317	-0.1047	-0.0392	NS	NS	0.96	100.442	2/ 9	0.0001	-0.17
20 - 21										
Female	18.1278	-0.0809	NS	NS	NS	0.84	52.328	1/10	0.0001	0.23
Male	20.7257	-0.1482	-0.0491	0.1389	NS	0.92	30.466	3/ 8	0.0001	-0.14
22 - 24										
Female	13.7540	-0.0775	NS	0.2350	-0.0869	0.69	5.860	3/ 8	0.0204	0.00
Male	15.3419	-0.0571	NS	NS	NS	0.40	6.772	1/10	0.0264	0.53
25 - 29										
Female	12.8703	-0.0617	NS	NS	-0.1716	0.97	164.318	2/ 9	0.0001	-0.11
Male	17.1345	-0.1201	NS	NS	-0.1907	0.87	29.337	2/ 9	0.0001	0.37
30 - 34										
Female	11.0073	NS	NS	-0.1767	-0.2141	0.97	127.564	2/ 9	0.0001	0.12
Male	10.8700	NS	NS	NS	-0.4334	0.88	75.795	1/10	0.0001	0.06
35 - 39										
Female	10.3786	NS	0.0346	-0.1982	-0.2053	0.97	89.290	3/ 8	0.0001	-0.52
Male	10.1746	NS	NS	NS	-0.5282	0.71	24.230	1/10	0.0006	0.21
40 - 44										
Female	14.5482	-0.1111	-0.0721	NS	-0.1759	0.97	96.013	3/ 8	0.0001	-0.35
Male	10.5445	NS	NS	NS	-0.6272	0.83	50.530	1/10	0.0001	0.11
45 - 49										
Female	10.7513	NS	NS	-0.2953	-0.1563	0.89	36.444	2/ 9	0.0001	-0.17
Male	13.6044	NS	NS	-0.6613	NS	0.75	30.548	1/10	0.0003	0.28
50 & Up										
Female	13.8862	NS	NS	-0.7613	NS	0.85	55.098	1/10	0.0001	0.02
Male	10.9300	NS	NS	NS	-0.6843	0.53	11.501	1/10	0.0069	0.11

Note: NS denotes elimination of a variable from the model for failure to meet .05 significance criterion.

Tuition successfully predicted the undergraduate enrollment rate in only one subgroup and in that case, the law of demand insists, the positive relationship must be spurious. Tuition comes into play more credibly when it is regressed on course load rather than enrollment rate; among older age groups of undergraduates and graduate students, both male and female, rising tuition is an effective predictor of falling course loads.

Financial aid was the variable that most often emerged with the "correct" positive sign as a useful predictor of enrollment rates. Among older students, "Finaid" was often negatively related to course loads. Since older students rarely qualify for financial aid, the explanation of course load trends lies elsewhere.

Projections Based on the Regression Equations

Although interpretation of multiple regression equations always is problematical, using the most effective predictors for each subgroup to project future headcounts and credit hours did produce credible results. We constructed one set of independent variable estimates for 1990, 1995, and 2000 -- a "Recession Model" -- that was characterized by high unemployment rates, high tuition, and slow income growth, with financial aid pegged at 55 percent of tuition (the historical ratio). The contrasting "Recovery Model" employed relatively low unemployment rates, small tuition increases, and more rapid income growth. Financial aid again was pegged at 55 percent of tuition. Cohort population projections for both models were identical to those used in the original projections designed to show the effect of population shifts.

Applying statistically significant regression weights for each subgroup to the "Recession" variables and the "Recovery" variables produced alternate sets of subgroup headcount and credit hour projections which, when aggregated, did not vary greatly from each other or from the earlier projections based on 1985 enrollment rates and course loads. By the year 2000, the Constant 1985 Model predicts 200,500 students, the Recession Model 202,800, and the Recovery Model 207,700. The business cycle models predict that men are more likely to attend when there is a recession while the enrollment of women responds more favorably to conditions of recovery. The fact that variation in total enrollments is so small results, in part, from these compensating behaviors.

Conclusions and Recommendations

Disaggregating enrollments into subgroups defined by age, gender, and degree level before undertaking projections is taxing but necessary at a time in history when population profiles are in flux. Analyzing credit hour production in this way is especially useful; empirical investigation of the course loads of student subgroups may well correct erroneous impressions about the enrollment patterns of older students and their contribution to full-time-equivalent or fiscal-year-equivalent headcounts.

The Michigan data show that course loads of many subgroups are declining while their enrollment rates are rising. We believe the two trends are related. Exploration of the relationship between economic variables and enrollment rates produced no evidence that students are staying away because a university education is getting harder to afford. A number of indicators did suggest, however, that in order to work long hours, students are

spreading their education over more terms than students of yesteryear.[5]

For older students, heavy workloads may always be necessary even if, as should happen, more financial aid is directed their way. Younger students may continue to work hours that prevent full-time course loads because they prefer earning to borrowing, or because they are no longer content to be "poor, starving students" who do without consumer goods until graduation.

One answer to the question, "Whatever happened to the enrollment decline?" is that students are staying around to be counted in five or more fall terms instead of four! Reversal of this trend seems unlikely. In this environment, a pragmatic response for faculty and administrators is to accept, thoughtfully analyze, and then perfect the role of mentor to working students and student workers.

NOTES

1. For a concise review of several national projections, see John Centra's article, "College Enrollment in the 1980s," in the January/February 1980 issue of The Journal of Higher Education, which is published by the Ohio State University Press.

2. The number of veterans in training at each of the 15 Michigan universities was available for 1980 through 1985 in ledgers at the Veterans Administration office in Detroit. The 1974 - 1979 Michigan figures were estimated as moving average ratios of national enrollments for 1974 - 1984. National figures were obtained from the VA publication, Trend Data 1961-1985. Office of Information Management and Statistics, Washington, D. C., June 1980.

3. From 1982 through 1985, the ratio of financial aid per fiscal-year-equated-student (FYES) to tuition collected for each FYES fluctuated in a narrow range, from 52.7% to 57.6%.

4. PC SAS is a software package for microcomputers licensed by SAS Institute, Inc. of Cary, NC.

5. The authors examined a series of enrollment reports compiled by the Presidents Council staff for evidence that undergraduates might simply be spreading out their enrollment over the academic year by attending summer terms. This did not appear to be the case; the ratio of fall term full-time-equivalent (FTE) enrollment to fiscal-year-equated students (FYES) was stable from 1975 through 1987. During the same period, the ratio of fall headcounts to FYES dropped from .90 to .82. These trends are consistent with anecdotal evidence that Michigan university undergraduates are extending degree completion beyond the traditional 4-5 years.

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